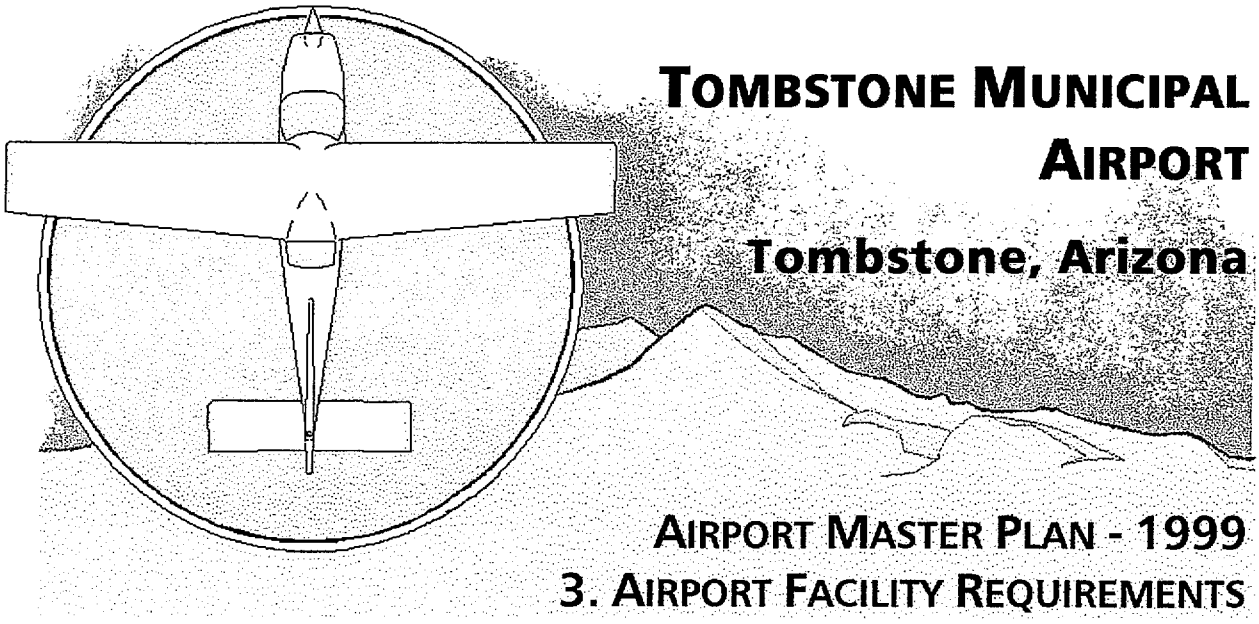

TOMBSTONE MUNICIPAL AIRPORT

Tombstone, Arizona

AIRPORT MASTER PLAN - 1999

3. AIRPORT FACILITY REQUIREMENTS

GENERAL REQUIREMENTS AND CRITERIA

Any growth in local aviation related activities or change in existing or anticipated use of an airport facility requires a corresponding program of airport development and implementation. This is necessary in order to assure that the facility remains able to effectively accommodate its demand and to effectively serve its market. In order to provide for the demands on the Tombstone Municipal Airport, a schedule of facility improvements has been developed, based on an inventory of the existing airport facilities and the development of forecast aircraft activity through the twenty-year planning period.

The recommendations for each of the airside and landside facilities were developed accepting the following criteria:

- The dimensional standards and design criteria for all improvements proposed within the planning period shall be as detailed in FAA Advisory Circular AC 150/5300-13, Airport Design and the Arizona Department of Transportation's (ADOT) Transportation Board Policies, 1998 Edition. A printout from the FAA's Airport Design program is included at the end of this section (pages FAA-1 through FAA-4). Excerpts from the ADOT Transportation Board Policies is also included (see pages ADOT-1 through ADOT-3). This includes criteria for the existing and ultimate airport configurations.

- The existing critical aircraft is a mix of ARC A-I light single and twin engined piston types, as detailed in Section 2. Immediate and Short Term improvements should be designed to serve ARC A-I aircraft, with consideration for possible future expansion to serve ARC B-II aircraft.

Wyatt Earp's .45 Colt SA Revolver (from the Gene Autry Western Heritage Museum collection).

The following narrative contains a discussion of each recommended item of development.

The discussion of each element includes recommendations for improvements to meet the Short Term (2000-2005), and the Ultimate Term (2006-2018) demand. The Ultimate Term program includes alternate recommendations for potential expansion of the airport to serve a greater range of aircraft. Recommendations for action in the Immediate Term (1999-2000) are also included when a deficiency has been defined which requires immediate correction for reasons of safety, or when a feature was found to be not able to fulfill its design function at the present levels of demand.

Summary tables for recommended Immediate, Short Term and Ultimate Term development are included at the end of this section.

PRIMARY RUNWAY REQUIREMENTS

The existing runway (Runway 6-24) at Tombstone is 4,600' long and 60' wide. It is surfaced with a bituminous-primed 6" lift of Aggregate Base Course (ABC). There are 200' long graded Runway Safety Areas (RSA's) at each end of the runway surface.

The existing runway is adequate for visual/daylight operations only. 1,000' x 250' x 450' FAA Runway Protection Zones (RPZ's) are required for this type of activity. Since the RPZ's extend beyond the airport property lines, land use control over the outer portions of the RPZ's is not currently provided.

The existing runway is not lighted or marked at the present time.

According to FAA Advisory Circular AC 150/5300-13 Airport Design, a runway's "Declared Distances" are the distances that the airport owner declares available for an aircraft's takeoff and landing operations. The current Takeoff Distance Available (TODA), Landing Distance Available (LDA), and the Accelerate-Stop Distance Available (ASDA) for Runway 6-24 are 4,600 feet, the total surfaced runway length.

The previous section (Section 2. Aviation Demand Forecasts) indicated that the present runway length of 4,600' will be able to accommodate many light single and twin engined piston aircraft, as well as some larger and/or faster types with the addition of an adequate pavement surface and related facilities improvements. These aircraft are a mix of ARC A-I, B-I and B-II types, limited to takeoff weights of 12,500 pounds or less.

In order for the airport to be able to accommodate a greater range of these aircraft in the future, additional runway length should be considered. The

analysis included in Section 2 suggests that a reasonable mix of aircraft through ARC B-II could be accommodated by a 6,100' long runway.

The FAA's AC 150/5325-4A, Runway Length Requirements for Airport Design recommends the following runway lengths for an airport at an altitude of 4,750' MSL, with a mean daily maximum temperature of 95° Fahrenheit (as calculated using the FAA's Airport Design computer software):

FAA AC 150/5325-4A Primary Runway Length Recommendations for Tombstone Municipal Airport

Small airplanes (12,500 pounds or less):	
with approach speeds of less than 30 knots	440 feet
with approach speeds of less than 50 knots	1,180 feet
Small airplanes with less than 10 passenger seats:	
75 percent of these small airplanes	4,560 feet
95 percent of these small airplanes	6,040 feet
100 percent of these small airplanes	6,270 feet
Small airplanes with 10 or more passenger seats	6,270 feet
Large airplanes of 60,000 pounds or less:	
75 percent of these large airplanes at 60% useful load	7,160 feet
75 percent of these large airplanes at 90% useful load	9,030 feet
100 percent of these large airplanes at 60% useful load	11,430 feet
100 percent of these large airplanes at 90% useful load	11,430 feet

Examination of the above table suggests that the Section 2 analysis of critical aircraft mix is supported by the FAA criteria. According to the FAA, 75% of small aircraft with less than 10 passenger seats (those that are 12,500 pounds or less) would be accommodated by the present 4,600' runway. This utilization would be increased to between 95% and 100% of these aircraft with the addition of a 6,100' long runway.

Immediate Term (1999-2000) Recommendations:

The existing runway should be paved with a 2½" asphaltic concrete surface course in order to provide adequate pavement strength to accommodate increased utilization. The pavement should be designed to support the largest maintenance vehicle that will regularly use the runway, or a 12,500 pound aircraft with single-wheel tricycle landing gear. The 60' width is adequate for the present use.

The runway should be marked for visual operations.

The City should secure avigation easements or purchase land for the outer portions of the RPZ's on each end of Runway 6-24.

A 20:1 clear approach surface is recommended. Any existing obstructions to air navigation, as determined by reference to the requirements of FAR Part 77, should be removed or lighted.

Short Term (2001-2005) Recommendations:
Turnaround/Runup aprons should be provided at each runway end. These should extend at least 50 feet beyond the runway hold lines, which must be at least 125' from the runway centerline for airports serving ARC A-I, A-II, B-I and B-II aircraft with takeoff weights of 12,500 pound or less (per FAA AC 150/5340-1G).

The existing runway should be lighted with Medium Intensity Runway Lighting (MIRL), equipped with pilot-actuated radio control.

Ultimate Term (2006-2020 / Alternate Expansion) Recommendations:
If the potential demand on the Tombstone airport justifies it in the future, airport development should include provision of a 6,100' long runway, designed to serve ARC B-II aircraft with up to 12,500 pound takeoff weights. The runway pavement width should be increased to 75'.

Medium Intensity Runway Lighting (MIRL) will be adequate for this runway. Avigation easements or fee land acquisition for RPZ's for visual operations should be provided. The RPZ trapezoid dimensions should be 1,000' x 250' x 450'. A 20:1 clear approach surface is recommended.

CROSSWIND RUNWAY REQUIREMENTS

The FAA recommends that a secondary (crosswind) runway be developed if the wind coverage on the primary runway is less than 95% (see FAA AC 150/5300-13, Change 4, paragraph 203. b.). A crosswind runway may also be justified based on specific local conditions.

Wind Data Analysis

The overall operational safety of an airport is affected by the direction of its runways in relationship to the prevailing wind. In general terms, smaller aircraft are affected more by wind, although wind conditions will affect operation of any aircraft to some degree. Crosswinds are often a contributing factor in light aircraft accidents. Therefore, orientation of the runway such that it is aligned with the prevailing wind for the greatest percentage of the time will add substantially to the safety and usefulness of the airport.

wind velocity multiplied by the sine of the angle between the wind direction and the runway direction.

Wind coverage is defined as the percentage of the time that the crosswind components are below an acceptable velocity. These acceptable velocities vary with the airport's design Airport Reference Code (ARC), as follows:

Acceptable Crosswind Components
for Various Airport Reference Codes (ARC)

ARC A-IV through D-VI	20.0 knots
ARC A-III, B-III, and C-I through D-III	16.0 knots
ARC A-II and B-II	13.0 knots
ARC A-I and B-I	10.5 knots

Source: FAA AC 150/5300-13, Appendix 1

The most desirable runway orientation based on wind is the one which has the greatest wind coverage. As was mentioned above, the FAA recommends a minimum wind coverage of 95%. If a single runway cannot meet this criteria, a crosswind runway is recommended, aligned such that the total wind coverage for the two runways will be at least 95%.

Digital wind data which was collected at the Kendall Watershed Hydrologic Field Site (about 5 miles northwest of the Tombstone Airport) was used in the wind analysis for this study. The most recent record data available, covering August 15, 1990 through December 31, 1995, was used for the analysis. The data consists of automated records taken at twenty minute intervals throughout the period. The raw digital data from this station was converted to standard FAA format so that the FAA Wind Analysis software could be used.

The Tombstone Municipal Airport's current design Airport Reference Code is ARC A-I (see Section 2, Aviation Demand Forecasts), based on the present utilization. However, with improvement, the airfield may potentially be used by a wide range of aircraft types, including those in the ARC B-I and B-II categories.

In order to form an accurate basis for runway development recommendations, two separate wind data analyses were undertaken for Runway 6-24, each

considering both the 10.5 knot (ARC A-I / B-I), 13 knot (ARC B-II) and, for reference purposes, the 16 knot situations, as follows:

1.) Annual/All-Weather data analysis.

2.) High-Wind analysis (considering only winds over 16 knots).

The resulting wind coverages were computed using the FAA's Airport Design Wind Analysis software. The results of the computations are listed in the table below.

Tombstone Municipal Airport
Results of Wind Data Analysis - Runway 6-24

Coverage	Annual	Over 16 knots
10.5 knots	90.79%	42.47%
13 knots	95.19%	53.54%
16 knots	98.69%	68.82%

Wind Data Source: Kendall Watershed Hydrologic Field Site records for August 15, 1990 through December 31, 1995.

(Calculations made using the FAA Wind Analysis Software)

The results of the wind data analysis indicate that a crosswind runway may be justified for aircraft in the 10.5 knot ARC A-I and B-I categories, the airport's current design configuration. Based strictly upon the FAA guidelines, a crosswind runway will not be required to adequately serve the ultimate critical aircraft in the 13-knot ARC B-II category.

Alternates for ultimate runway development are presented in the following section, 4. Development Alternates.

TAXIWAYS

At the present time, the taxiway system is limited to the 25' wide connector taxiway that runs from the west end of Runway 6-24 to the existing aircraft parking apron. The taxiway pavement was found to be in good condition, although the shoulders were overgrown with vegetation.

The taxiway is not lighted or marked at the present time.

As use of the airport increases in the future, additional taxiway access may be required to assure unrestricted movement of aircraft from the runway environment to parking and hangar areas. Larger aircraft will also require a wider pavement surface. As activity at the airport increases, turn around and runup "jug handles" at each runway end should be provided.

Immediate Term (1999-2000) Recommendations:
The existing connector taxiway pavement should be marked with a 6" wide yellow centerline stripe and runway hold line striping. Taxiway shoulders should be cleared of existing vegetation and treated with an appropriate herbicide.

Short Term (2001-2005) Recommendations:
The existing connector taxiway should be lighted with Medium Intensity Taxiway Lighting (MITL) concurrent with Runway 6-24 lighting.

New hangar access taxiways should be constructed to serve new hangar development areas. Hangar access taxiways may be unlighted.

A preservative seal should be applied to the taxiway pavement during this development term.

Ultimate Term (2006-2020) Recommendations:
Taxiway "jug handle" type turn arounds should be constructed concurrent with the widening and/or extension of Runway 6-24. These turn arounds should be lighted with Medium Intensity Taxiway Lights (MITL), and marked with center line striping and hold lines. The hold lines must be located at least 125' from the runway centerline for airports serving ARC A-I, A-II, B-I and B-II aircraft with takeoff weights of 12,500 pound or less (per FAA AC 150/5340-1G).

The existing apron access taxiway should be relocated concurrent with the turn around construction.

AIRCRAFT PARKING AND STORAGE REQUIREMENTS

The airport currently has a 141' x 121' asphaltic concrete surfaced aircraft parking apron. The apron has tiedowns to accommodate six aircraft. Pavement and tiedowns were found to be in good condition.

The number of required tiedown spaces for based and transient aircraft use was determined by applying the following criteria and assumptions. In the estimates, the base year is assumed to be 2000, after initial improvements are made, in conformance with the activity forecasts developed in Section 2.

- Approximately 74.4% of the total peak daily operations are assumed to be by transient aircraft at the present time. The forecasts indicate that this percentage of use may decrease to between 68.7% (Market-Share Analysis Model) and 72.9% (Economic Trend Model) by 2020.
- Most visiting aircraft will arrive and depart on the same day. The actual number of peak transient aircraft is assumed to be one-half the peak transient daily operations.
- Seventy-five percent of the transient aircraft will be parked on the apron at the same time during the peak period.
- Ten percent of the based aircraft may also be parked on the apron temporarily or seasonally.

The following calculations were made to derive the recommended number of tiedown spaces to be provided on the parking apron in the present and ultimate scenarios.

Where: D = Average Daily Peak Operations.
T = Total daily peak transient operations.
N = Number of required tiedowns for transients.
B = Number of based aircraft.
S = Total number of recommended tiedowns.

For base year (2000) condition:

T = D (0.744) = 14(0.744) = 10.42
N = (T/2) 0.75 = (10.42/2)0.75 = 3.91
N = 4
S = (0.10 (B))+N = (0.10 (5))+4 = 4.5 = **5**

For Ultimate (2020) condition (Market-Share Analysis Model):

T = D (0.687) = 16(0.687) = 10.99
N = (T/2)0.75 = (10.99/2)0.75 = 4.12
N = 4
S = (0.10 (B))+N = (0.10(7))+4 = 4.7 = **5**

For Ultimate (2020) condition (Economic Trend Model):

T = D (0.729) = 18(0.729) = 13.12
N = (T/2)0.75 = (13.12/2)0.75 = 4.92
N = 5
S = (0.10 (B))+N = (0.10(7))+5 = 5.7 = **6**

In the above estimates, it is assumed that most based aircraft owners will prefer to park their aircraft within a hangar, if available at a reasonable cost. For this reason, adequate land area for hangar construction should be provided for all forecast based aircraft through the planning period (7 based aircraft by 2020). These may be constructed as required by private interests upon leased land, or by the City to provide a revenue-producing rental base.

If hangar space is not available and the forecast levels of activity do occur, additional apron space will be required to accommodate the 7 based aircraft.

The existing aircraft parking apron's 6 available spaces will be adequate to meet the needs throughout the twenty-year planning period, assuming that hangar space will be provided for based aircraft.

Immediate Term (1999-2000) Recommendations:
The existing parking apron has a single "open joint" crack that runs its entire length. Other than this, the pavement is in good condition. Crack sealing should be performed and the pavement should be marked with a 6" yellow taxilane centerline stripe and tiedown "tees".

Adequate space for construction of future hangars should be set aside.

The City should consider construction of a secured aircraft storage hangar structure which could be rented to based aircraft owners on a monthly basis and to transients on a daily basis. This would provide a needed level of security that would make the Tombstone airport more attractive to local aircraft owners and tourists. The hangar could consist of an unheated "post-frame" structure with keypad security locks. A Tee-hangar configuration would provide the best method of individual security.

Short Term (2001-2005) Recommendations:
Security floodlighting should be installed in the aircraft parking and hangar areas. The apron should receive a preservation seal coat during this term.

Ultimate Term (2006-2020) Recommendations:
Adequate aircraft parking or hangar space to accommodate the projected demand should be programmed for the Ultimate Term, and constructed when justified by the actual level of demand.

TERMINAL BUILDING REQUIREMENTS & RECOMMEND-ATIONS

The Estimated Peak Hourly Demand, as established in Section 2, was used to arrive at an estimate of the required Terminal Building area for the anticipated general aviation demands through the planning period. A basic criteria of 50 square feet of building space per peak hour passenger or pilot was applied to the assumed rate of 2.5 occupants per peak hour aircraft.

Using this criteria, the estimated minimum Terminal building space for the base year (2000) time frame is (2.5)(50)(2) or 250 square feet. The projections for potential year 2020 activity indicate that this size will be adequate throughout the planning period.

Short Term (2001-2005) Recommendations:
The 250 square foot Terminal Building should be constructed adjacent to the parking apron. It may optionally be incorporated into a City-owned hangar structure (as recommended above).

AUTOMOBILE PARKING AND ACCESS REQUIREMENTS

The Estimated Peak Hourly Demand was also used as a basis to estimate the projected requirements for automobile parking. The criteria used is a factor of 3.25 automobiles per peak hour operation. This factor allows for 2.5 occupants per aircraft operation during the peak hour, plus allowance for airport employees and visitors.

The estimated automobile parking requirements for the base year 2000 time frame is, therefore, (3.25)(2) or approximately 7 spaces. The forecasts indicate that this will be adequate throughout the twenty-year planning period.

Vehicular access to the airport is presently provided by a graded road that is in relatively poor condition.

Immediate Term (1999-2000) Recommendations:
The existing access road should be paved. A 24' wide pavement surface will be adequate to serve the intended use.

A paved automobile parking area which will accommodate 7 cars should be developed concurrent with the access road improvements.

LAND ACQUISITIONS

The existing airport property will be adequate for all recommended development through the ultimate planning period with the exception of land acquisitions for approach zone protection of the existing runway, and for the possible extension of Runway 6-24 or development of new 6,100' runway in the Ultimate Term.

In order to comply with FAA minimum design criteria, approach zone protection may be accomplished by acquisition of Avigation Easements that will encompass at least the limits of the 1,000' x 250' x 450' Runway Protection Zones (RPZ's) at each end of the runway. Additional land required for runway extension or new runway development should be acquired in fee.

All of the land recommended for acquisition for either expansion or approach protection is State trust land. The Arizona State Land Department has advised that their preference is that all land be acquired in fee, rather than easements or rights-of-way (see letter Exhibit B, at the end of Section 5 of this report).

Immediate Term (1999-2000) Recommendations:
Adequate land should be acquired to encompass the existing Runway 6-24 RPZ's.

Ultimate Term (2006-2020) Recommendations:
Adequate land for development of ultimate runway, taxiway and related improvements in the Ultimate Term should be acquired in fee. Approach zone (RPZ) protection should also be accomplished by the acquisition of land in fee, to comply with the Arizona State Land Department's preference.

FENCING

The existing airport property is enclosed by a barbed wire fence. In general, the fence is in fair condition at the present time. Portions of the fence are in good condition. A vehicular gate and cattle guard are in good condition.

Immediate Term (1999-2000) Recommendations:
The terminal area should be enclosed with a chain-link security fence.

Short Term (2001-2005) Recommendations:
The existing property line fencing should be rehabilitated in the Short Term.

Ultimate Term (2006-2020) Recommendations:
Property line fencing should be extended to encompass all new fee acquisitions in the Ultimate Term.

Airport Visual Aids

The existing primary wind cone is not lighted, but is in good condition. There is no existing segmented circle. A secondary unlighted wind cone located near the aircraft parking apron is in fair to poor condition. Because Runway 6-24 is not lighted at the present time, there is no rotating beacon.

The recommended runway and taxiway improvements include the installation of Medium Intensity Runway Lighting (MIRL). In order for the airport to be fully functional for night operations, a rotating beacon should also be installed.

The existing primary wind cone should be lighted and a concrete segmented circle installed. The secondary wind cone (adjacent to the apron) may be removed.

The safety of nighttime operations will be enhanced by the installation of Precision Approach Path Indicators (PAPI) at each runway end.

Short Term (2001-2005) Recommendations:
A rotating beacon should be installed concurrent with the installation of runway and taxiway lighting systems. The existing primary wind cone should also be lighted at this time, and a concrete segmented circle installed. The secondary wind cone should be removed.

Installation of Precision Approach Path Indicators (PAPI) at each runway end should be considered as part of the Short Term development.

Ultimate Term (2006-2020) Recommendations:
Runway extension or new runway development will require relocation or additional installation of PAPI's.

Aircraft Fuel Service

There is currently no aviation fuel available at the airport. Because of the projected low level of demand, it would be difficult to justify installation of a fuel system in terms of economics. However, a fuel system site should be set aside to allow for the possibility of installation of a fuel system by the City or by private entities in the future.

Utilities: Electricity, Water, Sewer and Telephone

At the present time, there are no utilities available at the airport site. The nearest utilities are located north of the airport, at or near the current City limits.

Electric service will need to be extended from an existing substation located

approximately 3½ miles north of the airport property along U.S. Highway 80.

City sanitary sewer service would also need to be extended from the City limits (about 3½ miles to the north). However, a sanitary sewer septic tank/drain field system would be much more economically feasible to serve the airport's projected low level of demand.

Extension of water mains from the City limits would also be an economic burden. The projected low level of demand at the airport could be served by installation of an onsite well and supply system. Interim service could be accomplished by hauling water from the City to an onsite elevated tank.

Telephone service will need to be extended from the City limits.

Immediate Term (1999-2000) Recommendations:
In the Immediate Term, necessary electric and telephone lines should be extended to serve the airport. This will be needed to serve the recommended Immediate Term secured aircraft storage hangar.

Short Term (2001-2005) Recommendations:
A suitable water system and sanitary sewer disposal system should be developed concurrent with the construction of the recommended terminal building.

RECREATIONAL AIRPORT FACILITIES

In 1992, ADOT - Aeronautics developed the Arizona Recreational Airport Master Plan, which selected 18 possible airport sites that would be good locations for use as recreational sites. The intent was that the owners of the 18 airfields listed in the plan could apply to the state for grants for development of eligible recreational improvments. The Tombstone Municipal Airport was not included on the plan.

Since the Recreational Airport Master Plan was published, only one airport has taken advantage of the funding for development of recreational facilities (Payson Airport, in north central Arizona). In order to generate more interest in the recreational airport program, ADOT plans to open the program up to other airport owners, who express interest in this type of development.

The Tombstone Airport Planning Advisory Committee has expressed interest in the development of the Tombstone Municipal Airport as a recreational airport. The development would consist of a prepared campsite area adjacent to the terminal area, with potable water available and restroom facilities.

General Development Phasing Plan Summary

The tables on the following pages are a summary of the general recommendations for facility improvements to be constructed within the Immediate Term, Short Term and Ultimate Term time frames.

Alternate methods for execution of the recommended major improvements are presented in the following Section.

The general development plan as presented in this section has been refined and is presented in greater detail in Section 6: Airport Layout & Development Phasing Plan. Estimated costs for the recommended development are presented in Section 7: Financial Plan.

GENERAL IMMEDIATE TERM DEVELOPMENT PLAN
Tombstone Municipal Airport
1999-2000

Runway 6-24 ..... Remove or mark all obstructions to FAR Part 77 airspace.

Pave runway with 2.5" of asphaltic concrete pavement (4,600' x 60'). Pavement design should be for 12,500 pound single-wheel gear aircraft, or the heaviest maintenance vehicle that will use the surface.

Mark Runway for visual operations.

Acquire adequate land for Runway Protection Zones (RPZ's) at each runway end.

Taxiways ..... Provide centerline pavement markings (6" wide yellow stripe), and hold line markings.

Clear taxiway shoulders and apply herbicide.

Aprons ..... Apply crack sealing.

Provide pavement taxilane centerline striping (6" yellow stripe) and tiedown "Tee" markings.

Hangars ..... Designate adequate hangar development land to allow for the projected ultimate demand (7 based aircraft).

Construct a secured aircraft storage hangar for based and transient aircraft.

Install security fencing to encompass the terminal area.

Auto Parking & Access Road ..... Pave the existing Access Road (24' wide) with asphaltic concrete pavement.

Provide a paved automobile parking area which will accommodate 7 cars.

Utilities ..... Extend electric and telephone service from the City limits to the airport property.

Fuel System ..... Set aside a suitable location to allow for the possibility of development of an aviation fuel system in the future.

GENERAL SHORT TERM DEVELOPMENT PLAN
Tombstone Municipal Airport
2001-2005

Runway 6-24	Install Medium Intensity Runway Lighting (MIRL) with pilot-actuated radio control.
Taxiways	Install Medium Intensity Taxiway Lighting (MITL) on the existing taxiway.
	Apply prevervative seal coat to taxiway pavement.
Aprons	Install security floodlighting in the apron area.
	Apply prevervative seal coat to apron pavement.
Terminal Building ...	Provide a 250 square foot general aviation terminal building.
Fencing	Refurbish the existing barbed wire property line fencing.
Airport Visual Aids ...	Install a new rotating beacon (on building or new tower).
	Provide lighting for the existing primary wind cone and construct a concrete segmented circle marker system.
	Remove the existing secondary wind cone.
	Install Precision Approach Path Indicators (PAPI) at each runway end.
Utilities	Develop an onsite water system and sanitary sewer disposal system.
Recreational Facilities	Develop an airport campground with restroom facilities.

GENERAL ULTIMATE TERM DEVELOPMENT PLAN
Tombstone Municipal Airport
2006-2020

Primary Runway ..... Provide additional runway length and width for increased use by larger/faster aircraft (expand the runway from 4,600' x 60' to 6,100' x 75'). Pavement design should be for 12,500 pound single-wheel gear aircraft, or the heaviest maintenance vehicle that will use the surface.

Extend/construct Medium Intensity Runway Lighting (MIRL) on the new runway extension (or new runway).

Acquire additional land for the ultimate improvements, and for RPZ land use protection.

Crosswind Runway ... Develop a new 4,900' x 120' graded crosswind runway.

Taxiways ..... Construct paved Turnaround/Runup "jug handles" at each runway end. Pavement design should be for 12,500 pound single-wheel gear aircraft.

Install Medium Intensity Taxiway Lighting (MITL) on the new "jug handles".

Reroute the existing parking apron access taxiway.

Aprons/Hangars ..... Provide adequate parking/storage space (tiedowns or hangar space) to accommodate the ultimate demand.

Fencing ..... Extend property line fencing to encompass all ultimate fee acquisitions.

Airport Visual Aids ... Install (or relocate) Precision Approach Path Indicators (PAPI) at all runway ends.

The following pages (FAA-1 through FAA-4) are printouts from the FAA's Airport Design software. They contain a summary of the design criteria as defined by FAA Advisory Circular AC 150/5300-13.

AIRPORT DESIGN AIRPLANE AND AIRPORT DATA

Aircraft Approach Category A
Airplane Design Group I (Small Airplanes)

Airplane wingspan	48.99 feet
Primary runway end is visual	
Other runway end is visual	
Airplane undercarriage width (1.15 x main gear track)	9.00 feet

RUNWAY AND TAXIWAY WIDTH AND CLEARANCE STANDARD DIMENSIONS

Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is not treated as a factor:

VFR operations	700 feet
VFR operations with intervening taxiway	700 feet
VFR operations with two intervening taxiways	700 feet
IFR approach and departure with approach to near threshold	2500 feet less 100 ft for each 500 ft of threshold stagger to a minimum of 1000 ft.

Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is a factor:

VFR operations	2500 feet
IFR departures	2500 feet
IFR approach and departure with approach to near threshold	2500 feet
IFR approach and departure with approach to far threshold	2500 feet plus 100 feet for each 500 feet of threshold stagger.
IFR approaches	3400 feet

Runway centerline to parallel taxiway/taxilane centerline	149.4	150 feet
Runway centerline to edge of aircraft parking	125.0	125 feet
Taxiway centerline to parallel taxiway/taxilane centerline	68.8	69 feet
Taxiway centerline to fixed or movable object	44.3	44.5 feet
Taxilane centerline to parallel taxilane centerline	63.9	64 feet
Taxilane centerline to fixed or movable object	39.4	39.5 feet

Runway protection zone at the primary runway end:

Length	1000 feet
Width 200 feet from runway end	250 feet
Width 1200 feet from runway end	450 feet

Runway protection zone at other runway end:

Length	1000 feet
Width 200 feet from runway end	250 feet
Width 1200 feet from runway end	450 feet

Departure runway protection zone:

Length	1000 feet
Width 200 feet from the far end of TORA	250 feet
Width 1200 feet from the far end of TORA	450 feet

Runway obstacle free zone (OFZ) width	250.0	250 feet
Runway obstacle free zone length beyond each runway end		200 feet
Approach obstacle free zone width	250.0	250 feet

Approach obstacle free zone length beyond approach light system		200 feet
Approach obstacle free zone slope from 200 feet beyond threshold		50:1
Inner-transitional surface obstacle free zone slope		0:1
Runway width		60 feet
Runway shoulder width		10 feet
Runway blast pad width		80 feet
Runway blast pad length		60 feet
Runway safety area width		120 feet
Runway safety area length beyond each runway end or stopway end, whichever is greater		240 feet
Runway object free area width		400 feet*
Runway object free area length beyond each runway end or stopway end, whichever is greater		240 feet**
Clearway width		500 feet
Stopway width		60 feet
Taxiway width	19.0	25 feet
Taxiway edge safety margin		5 feet
Taxiway shoulder width		10 feet
Taxiway safety area width	49.0	49 feet
Taxiway object free area width	88.6	89 feet
Taxilane object free area width	78.8	79 feet
Taxiway wingtip clearance	19.8	20 feet
Taxilane wingtip clearance	14.9	15 feet

Threshold surface at primary runway end:

Distance out from threshold to start of surface		0 feet
Width of surface at start of trapezoidal section		250 feet
Width of surface at end of trapezoidal section		700 feet
Length of trapezoidal section		2250 feet
Length of rectangular section		2750 feet
Slope of surface		20:1

Threshold surface at other runway end:

Distance out from threshold to start of surface		0 feet
Width of surface at start of trapezoidal section		250 feet
Width of surface at end of trapezoidal section		700 feet
Length of trapezoidal section		2250 feet
Length of rectangular section		2750 feet
Slope of surface		20:1

REFERENCE: AC 150/5300-13, AIRPORT DESIGN.

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* Advisory Circular AC 150/5300-13, AIRPORT DESIGN indicates 400', but computer program indicates 250'. This printout has been modified to reflect the correct Advisory Circular's criteria.

** Advisory Circular AC 150/5300-13, AIRPORT DESIGN indicates 240', but computer program indicates 300'. This printout has been modified to reflect the correct Advisory Circular's criteria.

AIRPORT DESIGN AIRPLANE AND AIRPORT DATA

Aircraft Approach Category B
Airplane Design Group II (Small Airplanes)
Airplane wingspan . . . . . 78.99 feet
Primary runway end is visual
Other runway end is visual
Airplane undercarriage width (1.15 x main gear track) . . . 9.00 feet

RUNWAY AND TAXIWAY WIDTH AND CLEARANCE STANDARD DIMENSIONS

Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is not treated as a factor:

VFR operations	700 feet
VFR operations with intervening taxiway	700 feet
VFR operations with two intervening taxiways	700 feet
IFR approach and departure with approach to near threshold	2500 feet less 100 ft for each 500 ft of threshold stagger to a minimum of 1000 ft.

Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is a factor:

VFR operations	2500 feet
IFR departures	2500 feet
IFR approach and departure with approach to near threshold	2500 feet
IFR approach and departure with approach to far threshold	2500 feet plus 100 feet for each 500 feet of threshold stagger.
IFR approaches	3400 feet

Runway centerline to parallel taxiway/taxilane centerline	164.4	240 feet
Runway centerline to edge of aircraft parking	250.0	250 feet
Taxiway centerline to parallel taxiway/taxilane centerline	104.8	105 feet
Taxiway centerline to fixed or movable object	65.3	65.5 feet
Taxilane centerline to parallel taxilane centerline	96.9	97 feet
Taxilane centerline to fixed or movable object	57.4	57.5 feet

Runway protection zone at the primary runway end:

Length	1000 feet
Width 200 feet from runway end	250 feet
Width 1200 feet from runway end	450 feet

Runway protection zone at other runway end:

Length	1000 feet
Width 200 feet from runway end	250 feet
Width 1200 feet from runway end	450 feet

Departure runway protection zone:

Length	1000 feet
Width 200 feet from the far end of TORA	250 feet
Width 1200 feet from the far end of TORA	450 feet

Runway obstacle free zone (OFZ) width	250.0	250 feet
Runway obstacle free zone length beyond each runway end		200 feet
Approach obstacle free zone width	250.0	250 feet

Approach obstacle free zone length beyond approach light system	200	feet
Approach obstacle free zone slope from 200 feet beyond threshold	50:1	
Inner-transitional surface obstacle free zone slope	0:1	
Runway width	75	feet
Runway shoulder width	10	feet
Runway blast pad width	95	feet
Runway blast pad length	150	feet
Runway safety area width	150	feet
Runway safety area length beyond each runway end or stopway end, whichever is greater	300	feet***
Runway object free area width	500	feet
Runway object free area length beyond each runway end or stopway end, whichever is greater	300	feet***
Clearway width	500	feet
Stopway width	75	feet
Taxiway width 24.0	35	feet
Taxiway edge safety margin	7.5	feet
Taxiway shoulder width	10	feet
Taxiway safety area width 79.0	79	feet
Taxiway object free area width 130.6	131	feet
Taxilane object free area width 114.8	115	feet
Taxiway wingtip clearance 25.8	26	feet
Taxilane wingtip clearance 17.9	18	feet

Threshold surface at primary runway end:

Distance out from threshold to start of surface	0	feet
Width of surface at start of trapezoidal section	250	feet
Width of surface at end of trapezoidal section	700	feet
Length of trapezoidal section	2250	feet
Length of rectangular section	2750	feet
Slope of surface	20:1	

Threshold surface at other runway end:

Distance out from threshold to start of surface	0	feet
Width of surface at start of trapezoidal section	250	feet
Width of surface at end of trapezoidal section	700	feet
Length of trapezoidal section	2250	feet
Length of rectangular section	2750	feet
Slope of surface	20:1	

REFERENCE: AC 150/5300-13, AIRPORT DESIGN.

*** Advisory Circular AC 150/5300-13, AIRPORT DESIGN indicates 300', but computer program indicates 600'. This printout has been modified to reflect the correct Advisory Circular's criteria.

AIRPORT PLANNING GUIDELINES

I. BACKGROUND

Airport Planning Guidelines have been established by the State Transportation Board in order for the Aeronautics Division to accurately assess the limitations and deficiencies of airports in the State's Primary and Secondary Airport systems. These guidelines will be applied to airports in the Primary and Secondary system and evaluated periodically to determine the estimated statewide capital improvement costs required to bring the airports into compliance with the planning guidelines.

II. AIRPORT REFERENCE CODE

A. The FAA coding system for airports relates airport design criteria to the operational and physical characteristics of the airplanes intended to operate at an airport. The Airport Reference Code (ARC) consists of two components: Aircraft Approach Category and Airplane Design Group. The planning guidelines for airports in Arizona will be based on the FAA Airport Reference Code.

1. Aircraft Approach Category: The minimum approach speed of an aircraft at its maximum gross landing weight in the landing configuration.

2. Airplane Design Group: A grouping of airplanes based on wingspan.

III. AIRPORT PLANNING GUIDELINES FOR AIRPORTS IN AIRPORT REFERENCE CODE GROUP I:

These airports normally are designed to serve small aircraft, with operating gross weights of less than 12,500 pounds, capable of accommodating aircraft with less than 10 passengers with visual approaches to the runway(s).

A. Runway length and width: The minimum runway length and width will be determined by the predominant type of aircraft that operate at the airport and the approach visibility minimums at the airport. FAA Advisory Circular (AC) 150/5325-4, Runway Length Requirements for Airport Design and AC150/5300-13, Airport Design will be used to determine the appropriate runway dimensions.

B. Taxiways: A minimum of a Turnaround taxiway will be at both runway(s) ends.

C. Runway Safety Area: The runway safety area will be 120 feet wide centered on the runway centerline and a minimum length of 240 feet beyond the actual ends of the runway, in accordance with (IAW) FAA AC 150/5300-13.

D. The airport will have at least one windsock/wind indicator. This windsock should be lighted (if night operations are permitted) and located at/or near the runway midfield.

E. Both paved and unpaved airports should have a graded area for parking the based aircraft as well as at least two transient aircraft. All parking spaces should be equipped with a minimum of one tiedown. The location of the parking apron should be in accordance with FAA AC150/5300-13.

F. The airport should be free of obstructions in the primary, approach and transition surfaces in accordance with FAR Part 77, Objects Affecting Navigable Airspace. The minimum approach slope to the airport should be 20:1.

G. The airport should be equipped with Runway Delineators.

H. The airport should have a continuous access road to a paved city/town/county or state roadway system.

IV. AIRPORT PLANNING GUIDELINES FOR AIRPORTS IN AIRPORT REFERENCE CODE GROUP II:

These airports normally are designed to serve small to medium sized aircraft, with maximum gross weights of less than 25,000 pounds, accommodating less than 35 passengers. These airports will meet all of the minimum design standards of Group I and:

A. The airports with scheduled commercial passenger service will meet the minimum requirements of FAR Part 139.

B. Taxiways: These airports will have a minimum of a partial or full length parallel (mandatory for annual operations in excess of 20,000). If the runway is paved, the parallel taxiway should be paved. Runup areas should be provided at both ends of the runway(s).

C. The airports should be equipped with the following minimum navigational aids:

1. At least one lighted windsock/wind indicator located at/or near the midpoint of the runway.

2. A beacon.

3. Delineators or lighted runway and delineators on all taxiways.

4. An airport approach aid (Visual Approach Slope Indicator, Precision Approach Path Indicator, Generic Visual Glideslope Indicator) at those airports with more than 15,000 annual operations.

5. These airports should have the following Terminal services: a minimum of a telephone, access to weather data, access to FAA Flight Facilities, a waiting area, restroom facilities, portable fire extinguishers, and posted local area procedures/ emergency procedures. In the absence of fuel, eating and sleeping facilities, information should be available on where these accommodations can be obtained. NOTE: Terminal services may be provided by a Fixed Base Operator (FBO) and/or airport sponsor.

D. The airports should have a graded area for parking the based (non-hangared) aircraft as well as at least six transient aircraft at paved or unpaved airports. All apron parking spaces (paved/unpaved) should be equipped with at least three-point tiedowns. The location of the parking apron should be in accordance with FAA AC 150/5300-13.

E. The airports should be fenced.

V. AIRPORT PLANNING GUIDELINES FOR AIRPORTS IN AIRPORT REFERENCE CODE GROUP III, *IV and V*:

A. These airports normally are designed to serve small, medium and large sized aircraft, with maximum gross weights of less than up to 300,000 pounds, capable of accommodating aircraft with more than 35 passengers. These airports will meet all of the minimum design standards of Group I and II and. Airports with scheduled commercial passenger service will meet the minimum requirements of FAR Part 139.

B. All main runway(s), taxiways/taxilanes and apron areas will be paved.

C. All runways and taxiways will be lighted. Transient and local tiedown facilities will be lighted in the main terminal area.

D. Have the following minimum Terminal Facilities: on location weather data terminal; fuel facilities to accommodate both piston and jet aircraft; either commercial eating facilities or vending machines; access to rental car facilities; maintenance facilities for the repair of aircraft, avionics, engine and airframe; and a waiting/lounge area. (NOTE: Some or all of these services may be provided by the FBO's however, the airport sponsor is responsible for monitoring the condition of mandatory facilities.)

E. In addition, the following equipment may be authorized for this type facility: Crash-rescue equipment, Runway sweeper, landscaping tractor, and Snow-plow.

F. Emergency generating equipment for the Beacon, Runway Lights, Visual Approach Aid, ATCT (optional), and emergency equipment.

G. A nonprecision instrument approach to the main runway ends.